openreach

SIN 360

Issue 4.6

October 2024

Suppliers' Information Note

For The Openreach Network

Ethernet Customer Interfaces

Interface Characteristics

Each SIN is the copyright of British Telecommunications plc. Reproduction of the SIN is permitted only in its entirety, to disseminate information on the BT Network within your organisation. You must not edit or amend any SIN or reproduce extracts. You must not remove BT trademarks, notices, headings or copyright markings.

This document does not form a part of any contract with BT customers or suppliers.

Users of this document should not rely solely on the information in this document but should carry out their own tests to satisfy themselves that terminal equipment will work with the BT network.

BT reserves the right to amend or replace any or all of the information in this document.

BT shall have no liability in contract, tort or otherwise for any loss or damage, however arising from use of, or reliance upon, the information in this document by any person.

Due to technological limitations a very small percentage of customer interfaces may not comply with some of the individual characteristics which may be defined in this document.

Publication of this Suppliers' Information Note does not give or imply any licence to any intellectual property rights belonging to British Telecommunications plc or others. It is your sole responsibility to obtain any licences, permissions or consents which may be necessary if you choose to act on the information supplied in the SIN.

This SIN is available in Portable Document Format (pdf) from:

https://www.openreach.co.uk/orpg/home/helpandsupport/sins/sins.do

Enquiries relating to this document should be directed to: orsinsfa@openreach.co.uk

Issued by: Mark Hitch | **Issue:** 4.6 | **Date:** 01/10/2024e

Openreach Confidential
Openreach logo are trademarks of British Telecommunications plc. © British Telecommunications plc 2024. Openreach Limited, Registered office: 6 Gracechurch Street, London EC3V 0AT.Registered in England and Wales no. 10690039

CONTENTS

1. INTRODUCTION 3

2. ETHERNET INTERFACE OVERVIEW 3

3. TECHNICAL SPECIFICATION 4

3.1. 10/100 MBIT/S 4

3.2. 1000 MBIT/S 4

3.3. 10000 MBIT/S 5

4. PHYSICAL ARRANGEMENTS 6

4.1. PHYSICAL LOCATION CONNECTORS 6

4.2. NTE POWER SUPPLY REQUIREMENTS 6

5. REFERENCES 6

6. ABBREVIATIONS 7

7. HISTORY 7

Table 1: Ethernet access rates 3
Table 2: Gigabit Ethernet NTE technical specification 5
Table 3: 10 Gigabit Ethernet LAN and WAN PHY NTE technical specification 5

1. Introduction

This Suppliers' Information Note (SIN) describes the characteristics of Ethernet customer interfaces to the BT Network. It specifies interface characteristics based on published versions of IEEE recommendations.

Other SINs contain details of services delivered over Ethernet interfaces.

2. Ethernet Interface Overview

The Ethernet interface provides a physical access using IEEE 802.3 [1] Ethernet framing and point-to-point logical connections between accesses.

Ethernet interfaces support IEEE 802.1q [2] encapsulation.

The Ethernet Maximum Transmission Unit (MTU) size supported will be a minimum of 1522 bytes. Larger packets up to 2,000 bytes may be supported for specific services.

Customers can if required use spanning tree packets (802.1d [3], 802.1s [4] or 802.1w [5] control packets) across the Ethernet interface. The BT network will not participate with the spanning tree protocol but will tunnel spanning tree packets between customer sites.

The access speeds currently supported are listed in Table 1. Note that for some services the contracted data rate may be below the access rate; in this case traffic should be shaped on egress at the CPE, and will be rate-limited on ingress to the network.

Ethernet Access Rates	Ethernet interfaces
10 Mbit/s	10Base-T electrical
100 Mbit/s	100Base-T electrical
1000 Mbit/s	1000Base-T electrical 1000Base-SX optical 1000Base-LX optical
2500 Mbit/s	2500Base-T electrical
10000 Mbit/s	10GBase-LR optical 10GBase-LW optical 10GBase-SR optical

Table 1: Ethernet access rates

The access data rate of each Ethernet access will be 10, 100, 1000, 2500 or 10000Mbit/s as per the IEEE 802.3 [1] standard.

The Ethernet interface will support Ethernet access with the following interfaces:

- Ethernet: IEEE 802.3 at 10Mb/s
- Fast Ethernet: IEEE 802.3 at 100Mb/s
- Gigabit Ethernet: IEEE 802.3 at 1000Mbit/s
- 2.5 Gigabit Ethernet: IEEE 802.3 at 2500Mbit/s
- 10 Gigabit Ethernet IEEE 802.3 at 10000Mbit/s

3. Technical Specification

Ethernet access connections support the following types of customer interface:

1. 10/100/1000 Mbit/s
   RJ-45 connection with IEEE 802.3 [1] Ethernet at 10, 100 or 1000Mb/s, in full duplex mode.

2. 10/100/1000/2500 Mbit/s
   RJ-45 connection with IEEE 802.3 [1] Ethernet at 10, 100, 1000 or 2500Mb/s, in full duplex mode.

3. 1000 Mbit/s
   1000Base-SX or 1000Base-LX optical presentation with IEEE 802.3 [1] Gigabit Ethernet framing.

4. 10312.5 Mbit/s LAN PHY
   10GBase-LR or 10GBase-SR optical presentation with IEEE 802.3 [1] 10 Gigabit Ethernet LAN PHY framing.

5. 9953.85 Mbit/s WAN PHY
   10GBase-LW optical presentation with IEEE 802.3 [1] 10 Gigabit Ethernet WAN PHY framing.

3.1. 10/100/1000/2500 Mbit/s Electrical

The interface is the Network Termination Point (NTP), i.e. the point of connection between the BT Network Terminating Equipment (NTE) and the CPE interface. The Customer Interface consists of a RJ-45 type socket. The customer provides the category 5 connecting cords between the NTE and their own CPE. The maximum cable length between the NTP and the Customer CPE is 100m.

The RJ-45 type connector is as specified in the 10Base-T and 100Base-T, 1000Base-T, 2.5Gbase-T IEEE 802.3u/x/ab/bz [6] [7][12][13] specifications. Attention is drawn to the Intellectual Property Rights (IPRs) set out in the preface of this agreed International standard. It is the responsibility of the CPE supplier to ensure that they have the necessary rights from the owner of the IPR. The IPR owner has stated that they are willing to negotiate licenses under reasonable and non-discriminatory terms and conditions with applicants throughout the world.

3.2. 1000 Mbit/s Optical

Gigabit Ethernet conforms to the IEEE 802.3 [1] standard.

The interface is the Network Termination Point (NTP), i.e. the point of connection between the BT Network Terminating Equipment (NTE) and the CPE interface. The Customer Interface consists of either a Dual SC type or a FC/PC type or Dual LC type fibre interface port, operating at multimode (1000Base SX) **or** single-mode (1000BaseLX) (**not both on a single NTE**). The customer provides the fibre patch connectors between the NTE and CPE, the maximum fibre length is shown in Table 2. In some cases, the NTE will include a patch panel, which then forms the NTP.

The SX and LX type interface is as specified in the Gigabit Ethernet IEEE 802.3z [8] specifications. Attention is drawn to the Intellectual Property Rights (IPRs) set out in the preface of this agreed international standard. It is the responsibility of the CPE supplier to ensure that they have the necessary rights from the owner of the IPR. The IPR owner has stated that they are willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world.

Protocol	Gigabit Ethernet IEEE 802.3z [8]
Line Rate	1.25 GBaud (or 1Gbit/s)
Maximum Bit Error Rate	10^{-12}
Power Requirement	See Section 4.2
Customer Fibre Connector	SC type or FC/PC type or LC type
SX Fibre ***(Customer provided)***	Multimode 850nm, 50/125 or 62.5/125 micron
SX Fibre Maximum Delivery Distance	220 m from NTE's SX port for 62.5/125 fibre or 550 m from NTE's SX port for 50/125 fibre
LX Fibre ***(Customer provided)***	Single-mode 1310nm, 9/125 micron
LX Fibre Maximum Delivery Distance	3000 m from NTE's LX port
Laser Safety	Class 1 under all conditions as per IEC 825-1 [9]

Table 2: Gigabit Ethernet NTE technical specification

3.3. 10000 Mbit/s

10 Gigabit Ethernet conforms to the IEEE 802.3 [1] standard.

The interface is the Network Termination Point (NTP), i.e. the point of connection between the BT Network Terminating Equipment (NTE) and the CPE interface. The Customer Interface consists of a pair of SC type fibre interface ports (transmit and receive). The customer provides the fibre patch connectors between the NTE and CPE, the maximum fibre length is shown in Table 3.

The 10GBase-LR, 10GBase-SR and 10GBase-LW type interface is as specified in the 10 Gigabit Ethernet IEEE 802.3ae [11] specifications. Attention is drawn to the Intellectual Property Rights (IPRs) set out in the preface of this agreed international standard. It is the responsibility of the CPE supplier to ensure that they have the necessary rights from the owner of the IPR. The IPR owner has stated that they are willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world.

Protocol	10 Gigabit Ethernet IEEE 802.3ae [11]
Line Rate	10.3125 Gbit/s for 10GBase-LR and 10GBase-SR (LAN PHY). 9.95328 Gbit/s for 10GBase-LW (WAN PHY)
Maximum Bit Error Rate	10^{-12}
Power Requirement	See Section 4.2
Customer Fibre Connector	SC type (SC/PC) or LC type
Customer interface Fibre (Customer provided)	Single-mode 1310nm, 9/125 micron for 10GBase-LR and 10GBase-LW. Multimode 850nm, 62.5/125 or 50/125 micron for 10GBase-SR
Customer interface Fibre Maximum Delivery Distance	10km from NTE's 10GBase-LW or 10GBase-LR port. For 10GBase-SR refer to table 4.
Laser Safety	Class 1 under all conditions as per IEC 825-1 [9]

Table 3: 10 Gigabit Ethernet LAN and WAN PHY NTE technical specification

Multimode Cable Bandwidth (MHz•km)	Maximum Operating Distance (m)
160	26
200	33
400	66
500	82
2000	300

Table 4: Multimode cable operating distances for 10GBase-SR interface

4. Physical Arrangements

4.1. Physical Location of Connectors

The User–Network Interface (UNI) is located at the connector on the BT Network Terminating Equipment (NTE) with a connector on the Customer side as described in the relevant part of Section 3 of this document.

4.2. NTE Power Supply Requirements

The NTE is locally powered and will require a local mains 50 Hz AC supply. It will be mounted in accordance with standard BT practices in agreement with the customer.

Where the NTE is powered by a customer provided –50 Volts, the NTE will be supplied with a connection lead which will be presented as wires only. As power supplies can vary slightly in output voltage and characteristics, the NTE will function with customer provided power supplies which are in accordance with the British Telecom Network Requirement, (BTNR) 2511 [10].

5. References

[1]	IEEE 802.3, Standards for Local Area Networks: CSMA/CD Access Method
[2]	IEEE 802.1q, Recommendations for Virtual LANs
[3]	IEEE 802.1d, Media Access Control (MAC) Bridges
[4]	IEEE 802.1s, Virtual Bridged Local Area Networks – Amendment 3: Multiple Spanning Trees
[5]	IEEE 802.1w, Media Access Control (MAC) Bridges – Rapid reconfiguration
[6]	IEEE 802.3u, Standards for Local & Metropolitan Area Networks – Supplement: Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units and Repeater for 100Mbit/s Operations, Type
[7]	IEEE 802.3x, Standards for Local & Metropolitan Area Networks: Specification for 802.3 Full Duplex
[8]	IEEE 802.3z, IEEE standards for Gigabit Ethernet in the LAN/WAN, 1998
[9]	IEC 825-1, International Electrotechnical Commission (IEC) Standard – Safety of Laser products Part 1
[10]	BTNR 2511 - Interface of telecomms equipment with a nominal 48v negative dc power supply
[11]	IEEE 802.3ae, IEEE standards for 10 Gigabit Ethernet in the LAN/WAN, 2002
[12]	IEEE 802.3ab, IEEE standards for 1000Base-T, 1999

[13]	IEEE 802.3bz, IEEE standards for 2.5GBase-T and 5GBase-T, 2016

6. Abbreviations

BT	British Telecommunications plc
CPE	Customers' Premises Equipment
CSMA	Carrier Sense Multiple Access
FC/PC	Fibre Connector/Planar Convex
IEC	International Electrotechnical Commission
IEEE	Institute of Electronic and Electrical Engineers [USA]
IPR	Intellectual Property Right
LAN	Local Area Network
MAC	Medium Access Control
MTU	Maximum Transmission Unit
NTE	Network Termination Equipment
NTP	Network Terminating Point
SC/PC	Subscription Channel/Physical Contact
SIN	Suppliers' Information Note [BT]
UK	United Kingdom
UNI	User-to-Network Interface
VLAN	Virtual Local Area Network
VPN	Virtual Private Network
WAN	Wide Area Network

7. History

Issue	Date	Revision changes
Issue 1.0	21st July 2000	First published as 'GigaBit Ethernet for the BT Network'
Issue 2.0	31st July 2003	Scope of declaration broadened to include 10/100 Mbit/s
Issue 3.0	22nd June 2004	Scope of declaration broadened to include 10000 Mbit/s
Issue 4.0	19th April 2005	Addition FC/PC type connector for 1000 Mbit/s
Issue 4.1	December 2012	2.0) Large packet MTU size amended to 2000 bytes. 3.2) Dual LC type fibre interface port added to 1000Mbit
Issue 4.2	December 2014	Change SINet site references from http://www.sinet.bt.com to http://www.btplc.com/sinet/
Issue 4.3	March 2016	Update to EAD 10000Mbit/s interface information and addition of maximum operating distance table for 10GBase-SR interface.

Issue 4.4	April 2017	Updated to include 1000-BaseT
Issue 4.5	May 2020	Change SINet site references from http://www.btplc.com/sinet/ to https://www.openreach.co.uk/orpg/home/helpandsupport/sins/sins.do
Issue 4.5	September 2021	Annual Review – no changes required – issue remains unchanged.
Issue 4.5	October 2022	Annual Review – no changes required – issue remains unchanged.
Issue 4.6	March 2023	Updated to include 2.5GBase-T electrical
Issue 4.6	October 2024	Annual Review – no changes required – issue remains unchanged.

-END-